

Original Research

Comparison of accelerated and conventional canine retraction mechanics into first bicuspid site

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ABSTRACT:

Background: Currently, conventional fixed orthodontic treatment requires about 1-2 years. Biologic tooth movement can be achieved with conventional orthodontic treatment techniques, but the canine retraction phase usually lasts for 6 to 8 months. **Aim of the study:** To compare accelerated and conventional canine retraction mechanics into first bicuspid site. **Materials and methods:** The present study was conducted on 16 patients (9 girls and 7 boys) ranging in age from 14 years to 25 years who needed canine retraction and first premolar extraction in the maxillary arch. The patients underwent orthodontic extraction of premolars and were then randomly grouped into two groups for canine retraction. Group 1 received conventional treatment with Preadjusted Edgewise Appliance bracket system and group 2 received rapid canine retraction through distraction osteogenesis. **Results:** We observed that the mean rate of canine retraction per week was more in accelerated canine retraction as compared to conventional method. Furthermore, canine rotation was more evident in accelerated canine retraction method. The results for both these findings were statistically significant. It was observed that total space closure in accelerated canine retraction was 6.03 mm as compared to conventional canine retraction which had 5.69 mm. **Conclusion:** Within the limitations of the present study, it can be concluded that accelerated canine retraction method has advantage of significant movement of canine within short time period as compared to conventional methods. The results were statistically significant.

Keywords: canine retraction, bicuspid extraction space, accelerated canine retraction.

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INTRODUCTION:

Currently, conventional fixed orthodontic treatment requires about 1-2 years.¹ More time is required for extraction cases, such as for adult patients, which is a great concern and poses high risk of caries,² external root resorption.³ Thus, accelerating orthodontic tooth movement and the resulting shortening of the treatment duration would be beneficial. Many researchers have utilized different biochemical methods involving medications to improve the speed and quality of orthodontic treatment, but the systemic influence on the body's metabolism makes this difficult to apply in Orthodontics. For premolar extraction cases,⁴ the first

phase of treatment is distal movement of the canines. Biologic tooth movement can be achieved⁵ with conventional orthodontic treatment techniques, but the canine retraction phase usually lasts for 6 to 8 months.⁶ Hence, the present study was conducted to compare accelerated and conventional canine retraction mechanics into first bicuspid site.

MATERIALS AND METHODS:

The present study was conducted on 16 patients (9 girls and 7 boys) ranging in age from 14 years to 25 years who needed canine retraction and first premolar extraction in the maxillary arch. The patients underwent

orthodontic extraction of premolars and were then randomly grouped into two groups for canine retraction. Group 1 received conventional treatment with Preadjusted Edgewise Appliance bracket system and group 2 received rapid canine retraction through distraction osteogenesis.

The following records were taken at weekly intervals till complete retraction of canines.

1. Measurements made intra-orally with digital calipers (Mututoya Digimatic Caliper)
2. Sequential orthopantomogram and intraoral periapical radiographs of maxillary canines and molars
3. Study models pre-operative and post-operative
4. Pulp vitality testing of lateral incisors, distracted canines, second premolars, and molars was carried out and recorded with electric pulp tester (Parkell)

5. Intra-oral clinical photographs.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student’s t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistically significant.

RESULTS:

Table 1 shows mean changes in maxillary canine and first molar position. We observed that the mean rate of canine retraction per week was more in accelerated canine retraction as compared to conventional method. Furthermore, canine rotation was more evident in accelerated canine retraction method. The results for both these findings were statistically significant. Table 2 shows mean space closure and time taken.

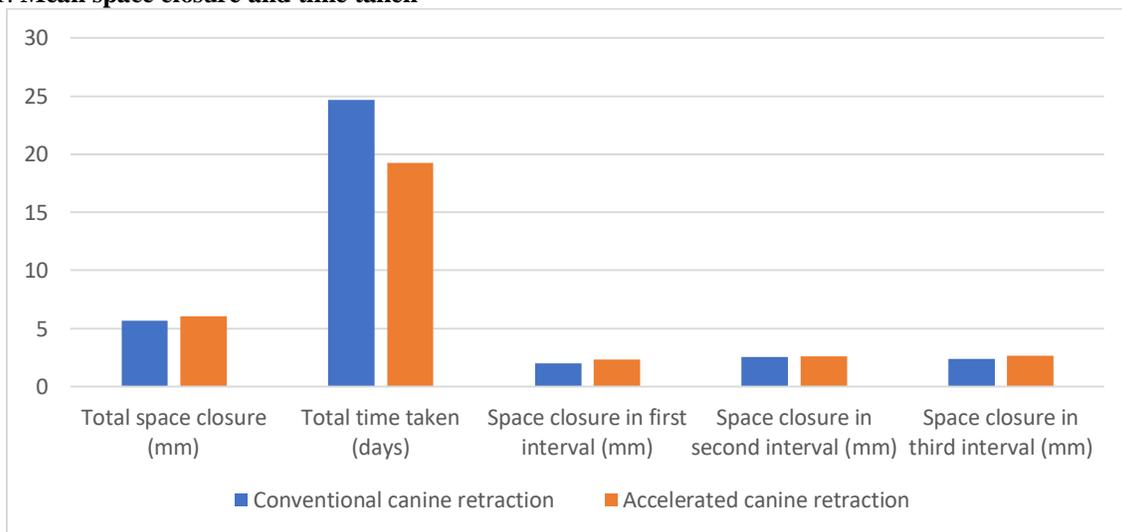
Table 1: Mean changes in maxillary canine and first molar position

Variables	Conventional canine retraction	Accelerated canine retraction	p-value
Rate of canine retraction (mm/week)	1.29	3.02	0.005
Canine rotation (degree)	10.69	13.89	0.002
Molar rotation (degree)	-0.29	0.41	0.25
Anterior movement of maxillary first molar (mm)	0.36	0.44	0.6

Table 2: Mean space closure and time taken

Variables	Conventional canine retraction	Accelerated canine retraction	p-value
Total space closure (mm)	5.69	6.03	0.12
Total time taken (days)	24.68	19.25	0.32
Space closure in first interval (mm)	2.02	2.32	0.09
Space closure in second interval (mm)	2.56	2.61	0.1
Space closure in third interval (mm)	2.41	2.63	0.2

Fig 1: Mean space closure and time taken



It was observed that total space closure in accelerated canine retraction was 6.03 mm as compared to conventional canine retraction which had 5.69 mm. total time taken for space closure was 24.68 days with conventional method and 19.25 days with accelerated method. The space closure for first, second and third interval was more with Accelerated canine retraction method. The results on comparison were statistically non-significant.

DISCUSSION:

In the present study, we compared conventional canine retraction with accelerated canine retraction. It was observed that the mean rate of canine retraction per week was more in accelerated canine retraction as compared to conventional method. Furthermore, canine rotation was more evident in accelerated canine retraction method. The results for both these findings were statistically significant. The total space closure in accelerated canine retraction was 6.03 mm as compared to conventional canine retraction which had 5.69 mm. total time taken for space closure was 24.68 days with conventional method and 19.25 days with accelerated method. The results were compared with previous studies. Gkantidis N et al assessed the available evidence on the effectiveness of accelerated orthodontic tooth movement through surgical and non-surgical approaches in orthodontic patients. Eight trials reported on low-intensity laser, one on photobiomodulation, one on pulsed electromagnetic fields, seven on corticotomy, and one on interseptal bone reduction. Two studies on corticotomy and two on low-intensity laser, which had low or unclear risk of bias, were mathematically combined using the random effects model. Higher canine retraction rate was evident with corticotomy during the first month of therapy and with low-intensity laser in a period longer than 3 months. The quality of evidence supporting the interventions is moderate for laser therapy and low for corticotomy intervention. In conclusion, there is some evidence that low laser therapy and corticotomy are effective, whereas the evidence is weak for interseptal bone reduction and very weak for photobiomodulation and pulsed electromagnetic fields. Khanna R et al evaluated the amount of canine retraction with periodontal distraction using miniscrew implants and NiTi coil spring. Sample comprised of 25 patients who were scheduled for all 1st premolar extraction (13 males and 12 females), in the age range of 16–22 years with mean age 18.8 ± 2.7 years. For each patient left side served as control side (Group I) and right side as experimental side (Group II). At the time of first premolar extraction, periodontal distraction was performed only on the experimental side, followed by retraction of canine from mini-implant by closed NiTi coil spring on both the sides. “Nemotech” software was used to evaluate the amount

of canine retraction for a period of 3 months. Significantly higher amount of tooth movement was seen from T0–T1 and from T1–T2 in Group II for the maxillary parameters 3C-5C, 6CF-3C, 3C-I/3C-J and for the mandibular parameter 6CF''-3C''. Whereas no significant amount of tooth movement was observed for maxillary and mandibular parameters between T2-T3 except for 6CF''-3C'' which was significantly higher for the Group II. In conclusion, there was accelerated canine retraction on the periodontal distraction, side as compared to the control side, with negligible anchorage loss.^{7,8}

Makhlouf M et al compared the amount of tooth movement during canine retraction comparing two different retraction mechanics; friction mechanics represented by a NiTi closed coil spring versus frictionless mechanics represented by T - loop, and their effect on root resorption using Cone Beam Computed Tomography (CBCT). Ten patients were selected in a split-mouth study design that had a malocclusion that necessitates the extraction of maxillary first premolars and retraction of maxillary canines. The right maxillary canines were retracted using T - loops fabricated from 0.017 X 0.025 TMA wires. The left maxillary canines received NiTi coil spring with 150 gm of retraction force. Pre retraction and post retraction Cone Beam Computed Tomography were taken to evaluate the amount of tooth movement and root resorption using three-dimensional planes. T - loop side showed statistically significant higher mean anteroposterior measurement than NiTi coil spring side, indicating a lower amount of canine movement pre and post a canine retraction. Concerning the root resorption, there was no statistically significant change in the mean measurements of canine root length post retraction. They concluded that the NiTi coil spring side showed more distal movement more than the T-loop side. Both retraction mechanics with controlled retraction force, do not cause root resorption. Haliloglu-Ozkan T et al investigated the effects of a minimally invasive, flapless procedure to enhance tooth movement in both jaws and to determine whether this triggers the acceleration when repeated monthly. The sample consisted of thirty-two individuals whose orthodontic treatment required canine retraction. They were divided into an experimental group and control group. Osteopunctures were performed using orthodontic mini-screws at the distal aspects of the canine teeth at the beginning and on the fourth week of distalization in the experimental group. The control group was treated with conventional mechanics. All canines were retracted. The rates of canine distalization, rotation, and tipping were measured on the first, fourth, and eighth weeks of distalization. First molar anchorage loss was also measured. Intergroup and intragroup analyses were performed. Flapless osteopuncture-facilitated tooth

movement resulted in greater canine distalization and reduced molar movement in the maxilla in the experimental than in the control group during the first month of distalization. In addition, the extent of upper canine movement was significantly higher in the experimental group in the first month than in the second. No differences in canine and molar movement in the mandible were observed between the two groups. They concluded that OP is an effective method for increasing the rate of tooth movement in the maxilla. Repeating the procedure monthly does not appear to show a major advance of tooth movement.^{9,10}

CONCLUSION:

Within the limitations of the present study, it can be concluded that accelerated canine retraction method has advantage of significant movement of canine within short time period as compared to conventional methods. The results were statistically significant.

REFERENCES:

1. Fisher MA, Wenger RM, Hans MG. Pretreatment characteristics associated with orthodontic treatment duration. *Am J Orthod Dentofacial Orthop.* 2010;137:178–186.
2. Geiger AM, Gorelick L, Gwinnett AJ, Benson BJ. Reducing white spot lesions in orthodontic populations with fluoride rinsing. *Am J Orthod Dentofacial Orthop.* 1992;101:403–407.
3. Pandis N, Nasika M, Polychronopoulou A, Eliades T. External apical root resorption in patients treated with conventional and self-ligating brackets. *Am J Orthod Dentofacial Orthop.* 2008;134:646–651.
4. Rygh P. Elimination of hyalinized periodontal tissues associated with orthodontic tooth movement. *Scand J Dent Res.* 1974;82:57–73.
5. Vieira-Andrade RG, Drumond CL, Alves LP, Marques LS, Ramos-Jorge ML. Inflammatory root resorption in primary molars: prevalence and associated factors. *Braz Oral Res.* 2012;26:335–340.
6. Vig PS, Weintraub JA, Brown C, Kowalski CJ. The duration of orthodontic treatment with and without extractions: a pilot study of five selected practices. *Am J Orthod Dentofacial Orthop.* 1990;97:45–51.
7. Gkantidis N, Mistakidis I, Kouskoura T, Pandis N. Effectiveness of non-conventional methods for accelerated orthodontic tooth movement: a systematic review and meta-analysis. *J Dent.* 2014 Oct;42(10):1300–19. doi: 10.1016/j.jdent.2014.07.013. Epub 2014 Jul 27. PMID: 25072362.
8. Khanna R, Tikku T, Sachan K, Maurya RP, Verma G, Ojha V. Evaluation of canine retraction following periodontal distraction using NiTi coil spring and implants - A clinical study. *J Oral Biol Craniofac Res.* 2014;4(3):192-199. doi:10.1016/j.jobcr.2014.10.001
9. Makhlof M, Aboul-Ezz A, Fayed MS, Hafez H. Evaluating the Amount of Tooth Movement and Root Resorption during Canine Retraction with Friction versus Frictionless Mechanics Using Cone Beam Computed Tomography. *Open Access Maced J Med Sci.*

- 2018;6(2):384-388. Published 2018 Feb 5. doi:10.3889/oamjms.2018.066
10. Haliloglu-Ozkan T, Arici N, Arici S. In-vivo effects of flapless osteopuncture-facilitated tooth movement in the maxilla and the mandible. *J Clin Exp Dent.* 2018;10(8):e761-e767. Published 2018 Aug 1. doi:10.4317/jced.54981